In the Specification

Please amend the specification of the present application as directed below.

Page 8, paragraph 1

A platform that includes a vibration sensor located within an inner core of a table~~top~~.

Page 9, paragraphs 4-5

Figure 4 is a cross-sectional view of an embodiment of platform with a damper in a table~~top~~ core;

Figure 5 is a schematic of a controllable damper in the table~~top~~ core;

Please replace the section entitled Detailed Description, with the following:

DETAILED DESCRIPTION

Disclosed is a platform that includes a vibration sensor located within an inner core of a table~~top~~. The table~~top~~ may have a first plate that supports a vibration-sensitive payload. The first plate may be separated from a second plate by the inner core. The sensor can be located within the core directly below the device. The sensor can be connected to an electrical connector attached to an external surface of the table~~top~~. A monitor can be readily plugged into the electrical connector to obtain vibration data from the sensor. The platform may also include a damper located within the inner core to reduce vibration of the table~~top~~. The damper may be an active device that is connected to control circuits located within, or outside, the inner core.

Referring to the drawings more particularly by reference numbers, Figures 1 and 2 show a platform 10. The platform 10 may include a table~~top~~ 12 that has a first surface 14, a second surface 16 and a plurality of side surfaces 18. The first surface 14 may extend along a first plate 20, the second surface 16 may extend along a second plate 22 and the side surfaces 18 may extend along one or more side plates 24.

The first plate 20 is separated from the second plate 22 by an inner core 26. The inner core 26 may contain a honeycomb structure 28 to provide support for the plates 20 and 22. The first plate 20 may have a plurality of threaded apertures 30. An external vibration-sensitive payload 32 may be attached to one or more threaded apertures 30 of the table~~top~~ 12. The payload 32 can be any type of device such as an optical component of an optical system, a device under test in a shaker machine, etc. Additionally, the table~~top~~ may be a platform for equipment used to fabricate semiconductor wafers, integrated circuits, etc. In general the table~~top~~ may be any platform used to support a component, system or equipment used in

manufacturing or laboratory environments. For purposes of claim interpretation the terms "platform" or "table~~top~~" ~~refers to the surface configured to be supported by one or more legs and~~ do not include any structure of an airplane or building, including airplane wings, fuselage, building walls or foundations.

One or more vibration sensors 34 may be located within the inner core 26 and attached to an underlying surface 36 of the first plate 20. The vibration sensor(s) 34 may be any type of device, such as an accelerometer, a geophone or displacement sensor that can sense vibration. Although three vibration sensors 34 are shown, it is to be understood that any number of sensors 34 can be located at any location of the table. The sensor(s) 34 can be connected to an electrical connector 38 attached to one of the side plates 24 of the table~~top~~ 12. The sensor 34 may be connected to the connector 38 by wire cables 40 that run through the inner core 26. The sensor(s) 34 can provide an output signal that is transmitted to the connector 38 over the cables 40.

As shown in Figure 3, a monitor 42 can be coupled to the sensor(s) 34 by plugging cables 44 into the connector 38. The monitor 42 may record and/or display vibration information provided by the sensor(s) 34. By locating the vibration sensor 34 within the inner core 26, the sensor 34 can measure the vibration directly beneath the external device 32 thereby providing more accurate data. The electrical connector 38 allows the monitor 42 to be readily coupled to the sensor(s) 34 thereby minimizing set-up time for monitoring vibration in the table~~top~~ 12. Although cables 40 and a connector 38 are shown and described, it is to be understood that the sensor(s) 34 may have a wireless transmitter (not shown) that wirelessly transmits the output signal(s).

Figure 4 shows an embodiment of a table~~top~~ assembly 10' with a damper 50 located within the inner core 26. The damper 50 may include an actuator 52 such as a voice coil that can be excited to induce a vibration that offsets and cancels the vibration within the table~~top~~ 12. The actuator 52 may include an electrical coil 54 that is magnetically coupled to a magnet mass 56.

The magnet mass 56 may be coupled to an actuator housing 57 by a pair of flexible diaphragms 58. The housing 57 is attached to the plates 20 and 22. That diaphragms 58 function as springs which combine with the mass 56 to form a spring/mass assembly. Providing a current to the coil 54 generates a magnetic force that moves the mass 56. The coil 54 can be excited in a manner to generate, together with the spring/mass assembly, a dynamic force to offset vibration in the table~~top~~ 12.

The vibration sensor 34 can be coupled to the table 12 by a screw 60 that extends through the top plate 20 and is attached to a sensor housing 62. The sensor 60 is preferably

coaxial and rigidly coupled to the actuator 52. The sensor 60 provides an output signal to a control circuit 64. The control circuit 64 processes the signal and provides an excitation signal to the coil 54 to generate an offsetting vibration that cancels the table vibration. The control circuit 64 can be located within the inner chamber 26 and connected to the sensor 60 and coil 54 by cables 66.

Figure 5 is a schematic of a controllable damper integrated into the table~~top~~ 10'. The signal from the vibration sensor 34 is transmitted to the controller 64. The controller 64 may contain amplifiers 75, compensators 76 and filters 77. Digital control or analog control can be employed. The transformed signal is fed into the active element 54, such as a coil, of the actuator incorporated into the table~~top~~ structure. The vibration actuator may further comprise the reaction mass 56, which may contain magnets, and the flexure 58 that provides elastic coupling between the mass and the table~~top~~. The amplification gains and other parameters of the controller modules are assigned and coordinated with the characteristics of the sensor, actuator and mechanical assembly so that a force Fa induced on the top face sheets of the table~~top~~ reduces the vibration at this point.

As control current flows through the coil 54, the electromagnetic force acts on the reaction mass 56, and the equivalent reaction force is acting on the stationary coils fastened to the table~~top~~ structure. The control loop is designed so that the phase and the amplitude of the summary force transmitted to the table~~top~~ structure counteract the vibration of the table~~top~~. Methods for designing controller and actuators for vibration abatement are known in the art.

It is preferred that the locations represented by points A,B and C in Fig. 5 be co-axial on the same vertical axis and rigidly connected. It is also preferable to design the control loop so that the active force acting on the table~~top~~ emulates the effect of a viscous damper in the frequency domain encompassing the main natural frequencies of the flexural vibration of the table~~top~~. This approach creates inherent stability and robustness with respect to the changes in the payload. To implement this strategy, the transfer function of the controller should be designed as:

$$K(\omega) = \frac{-i\omega k}{A(\omega)S(\omega)} \qquad (1)$$

Where;

$\omega = 2\pi f$ = a circular frequency.

$A(\omega)$= the actuator (shaker) transfer function, or ratio of the total force N exerted by the actuator on the structure to input voltage, N/V.

$S(\omega)$= the sensor transfer function, or the ratio of the sensor output voltage to the dynamic displacement, V/m.

$K(\omega)$= the controller transfer function, V/V.

k = an adjustable gain.

As a result, the force exerted by the active system on the table structure will equal $i\omega ku$, where u is the dynamical displacement amplitude of the table~~top~~, which is equivalent to the action of the viscous damping. Of course, other units can be used. The sensor may be an accelerometer, a velocimeter (such as a geophone) or a displacement sensor. Additional correcting filters may be used to improve the stability margins or other parameters.

Figure 6 shows an alternate embodiment of a table~~top~~ 12 wherein a strip 80 is located between the top plate 20 and a hole sealing tile 82. The hole sealing tile 82 may have a plurality of cups 84 that are located adjacent to the threaded apertures 30 to collect debris that fall through the apertures 30. The strip 80 may be a piezoelectric device that functions as a sensor and/or an actuator. Alternatively, optical cables or other devices may be located between the plate 20 and tile 82 to provide sensing and/or actuating functions. The tile 82 can protect the strip 80 during the manufacturing process of constructing the table~~top~~ 12.

While certain exemplary embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that this invention not be limited to the specific constructions and arrangements shown and described, since various other modifications may occur to those ordinarily skilled in the art.

In particular, the structure referred to as a table ~~top~~may be any kind of a support structure, including multi-level platforms or cradle platforms~~ configured to be supported by one or more legs or alternate support devices~~. The working surface of this support structure may be horizontal, vertical or even inclined. Accordingly, the line of action of the sensors and active dampers can be vertical, horizontal or inclined; multidirectional sensors or active dampers are also possible as a modification of this invention. Although Fig. 4 shows an actuator that is implemented as an electromagnetic shaker with a moving magnet and a stationary coil, other types of actuator designs can be used, in particular, electromagnetic designs with stationary magnets and moving coils, electrodynamic designs with one stationary and one moving coil, etc. Alternatively, stiff (e.g. piezoelectric) actuators can be employed to create a relative motion of the reactive mass and the table~~top~~.